

ROBIN JOHN TILLYARD.
1881-1937.

(*Memorial Series, No. 11.*)

(With Portrait.)

Robin John Tillyard was born at Norwich, England, on 31st January, 1881. As a boy he delighted in natural history, taking a special interest in birds and in butterflies and moths. His school days were spent at Dover College, a small Public School, which though of fairly recent foundation, occupies the buildings of an old Priory. Intended for the Army, he passed the Army Examination for Woolwich, but was rejected on medical grounds. On later competing for scholarships for Oxford and Cambridge he won them at both Universities, and, choosing Cambridge, proceeded to Queens' College as a Foundation Scholar.

In 1903 he took his B.A. degree, being placed as Senior Optime in the Mathematics Tripos; he then read Theology for a year, but on realizing that the Church was not his vocation, secured a teaching appointment at Sydney Grammar School as Second Mathematics and Science Master. As a teacher he was supremely successful and is still remembered with affection and gratitude by his former pupils.

In 1909 he married Patricia Craske, an old friend of his Cambridge days, and the first of their four daughters was born at Hornsby, New South Wales, in 1910.

While at the Grammar School his interest in dragonflies developed, his first paper on these insects being published by the Society in 1905. As a result of his increasing preoccupation with natural history he decided to abandon teaching for a scientific career and he resigned his post at the Grammar School in 1913.

He spent the years of 1913 and 1914 as a research student at Sydney University, working under Professor Haswell. In 1914 he was involved in a railway accident, and as a result of the injuries which he sustained, he suffered for the rest of his life from a crippled back. In spite of this setback he was granted a B.Sc. at the end of 1914, this being the first occasion on which the University had conferred such a degree for research.

In 1915 Tillyard was awarded a Linnean Macleay Fellowship in Zoology, which he held for a period of five years, and in 1917 his book "The Biology of Dragonflies" was published by the Cambridge University Press. This book, which still remains unchallenged as the best general work on these fascinating insects, and which had been preceded by the publication of some 46 papers on the same Order, immediately placed Tillyard in the forefront of young zoologists in Australia. During the same year a D.Sc. degree was conferred on him by the University of Sydney, where he was appointed a Lecturer in Zoology, and he was awarded the Crisp Medal by the Linnean Society of London for his paper published by that Society "On the Rectal Breathing Apparatus of some Anisopteroid Larvae".

Two years later, Tillyard undertook his first applied biological problem when he visited New Zealand at the request of the New Zealand Government in order to study and advise on problems associated with the trout fisheries. His report, entitled "Neuropteroid Insects of the Hot Springs Region, New Zealand, in Relation to the Problem of Trout Food", was published by the Society in 1920.

As a direct outcome of his visit to New Zealand, he was offered and accepted the position of Chief of the Biological Department of the Cawthron Institute, at Nelson. This Agricultural Research Institute, which had then only recently been opened, is endowed by funds bequeathed by Thomas Cawthron, a wealthy New Zealand pastoralist.

Before starting work at Nelson, Tillyard visited research organizations in America and England, and on his way to America he renewed his friendship with Frederick Muir, an entomologist employed by the Hawaiian Sugar Planters' Association. Muir was an ardent exponent of the biological control of insects, and there is no doubt that it was his influence which stimulated Tillyard's interest in this field of applied entomology.

In 1920, the year in which he went to Nelson, he was awarded an Sc.D. degree by Cambridge University.

The eight years which the Tillyards spent in New Zealand were undoubtedly the happiest which they enjoyed together as a family. The delightful climate and surroundings of Nelson; the splendid opportunities for research unhampered by excessive administrative duties; the growing sense of progress and achievement; the interest in the activities of their children, all combined to render these years memorable ones in every way.

In 1925 he was elected a Fellow of the Royal Society. In the following year his great work, the "Insects of Australia and New Zealand", was published by Angus and Robertson Ltd., and he again visited England, this time as a representative of New Zealand on the Research Committee of the Imperial Conference. During this overseas visit, Tillyard delivered numerous lectures, principally on fossil insects, which had long been one of his special interests, but also on the biological control of insects and weeds. While on the first topic he spoke as a master, on the second one he was on less sure ground, as although following the successful introduction of an insect parasite of the Woolly Aphis of apple trees into New Zealand, he had acquired great local merit, he was neither by training nor by temperament well equipped as an applied entomologist.

Among the lectures which he gave was the Trueman Wood Memorial Lecture of the Royal Society of Arts, and this lecture, which was delivered to a distinguished audience, gained him the Trueman Wood Memorial Medal. Tillyard, as well as being an excellent conversationalist, was a convincing and dramatic lecturer, and as a result of his campaign in England, he won considerable support for his projects, which involved research, the hoped-for outcome of which was to be the biological control of insects and weeds. He was promised, and later obtained, substantial grants from the newly-constituted Empire Marketing Board, for the purpose of building and equipping laboratories at Nelson.

There is no doubt that after his return to Nelson, following his triumphal tour of Europe and America, Tillyard felt cramped and isolated and in need of a wider field for his endeavours. In 1928 he was approached by the Commonwealth Council for Scientific and Industrial Research and asked to take charge of their developing entomological research activities. At first he demurred, but as a result of a brief visit to Australia he became persuaded, and agreed to accept the position of Chief of the Division of Economic Entomology. Following a short period in Australia, during which he selected a site for a house at Canberra, he again visited America and England, this time in order to recruit staff for the newly-formed Division, and also for the purpose of establishing a working relationship with the Parasite Laboratory of the Imperial Institute of Entomology.

In the eight years which followed, fresh honours came to him; his college at Cambridge elected him to an Honorary Fellowship in 1928; in 1929 he received the R. M. Johnston Memorial Medal from the Royal Society of Tasmania; and in 1935 the Mueller Memorial Medal from the Australian and New Zealand Association for the Advancement of Science. The new entomological laboratory buildings were ready for occupation at the end of 1929, and by 1930 the Division was on its feet and well established, and his staff busy on a variety of problems.

The years at Canberra were not happy ones. The condition of his injured spine deteriorated and he was in almost continuous pain; added to this he was by temperament unsuited to be a Civil Servant. He was disappointed that he was not able to show such rapid results as he had anticipated and had led others to expect; he was worried by personal jealousies and by his relationship with his administrative colleagues. Following a visit to the Pan-Pacific Science Congress in Chicago in 1933 he had a nervous break-

down, and in 1934 he resigned from the Council for Scientific and Industrial Research on the grounds of ill-health.

His last years of life were busy, though restless, and were occupied by a variety of interests to which he transferred his still apparently inexhaustible mental and physical energy. He died on 13th January, 1937, at Goulburn Hospital, at the age of 56, as the result of injuries received in a car accident.

Scientific Work.

Tillyard's most notable achievement in the field of applied entomology was his successful introduction into New Zealand in 1921 of a hymenopterous parasite (*Aphelinus mali*) of the Woolly Apple Aphis. The Woolly Aphis had previously been a major pest in New Zealand apple orchards and its permanent control by so simple a method earned for Tillyard a great deal of deserved public gratitude.

While in New Zealand he was responsible for initiating several other projects involving the biological control of insects. Some of these, such as the control of the Golden Oak Scale, have proved successful, while others, as for example, the biological control of the introduced European Earwig, failed to give the desired results. Likewise with weeds; whereas the Gorse Seed Weevil (*Apion ulicis*), which Tillyard first introduced into New Zealand, now shows promise of preventing the further spread of gorse, his introduction of the Cinnabar Moth (*Tyria jacobaeae*) for the control of ragwort has served no useful purpose, and his hopes of controlling blackberry, of which he would say there was but a single bush in the South Island of New Zealand and that it was two hundred miles long, were early doomed to disappointment.

When in 1928 he started work with the Council for Scientific and Industrial Research in Canberra, he was still obsessed with the idea that most entomological problems could be solved by biological methods, and in his report on the work of the Division of Economic Entomology for the year 1928-29, he summarized his research programme as "the control of noxious weeds by their natural enemies and the control of insect pests by beneficial parasites and predators". Of recent years the scope of the work undertaken by the Division has broadened very considerably, and though by now several of Tillyard's ambitious, and even sometimes fanciful projects, have long since been forgotten, it is pleasing to be able to record that a problem on which he first became interested in 1926, while still in New Zealand, now, some twenty years later, shows abundant promise of success. This problem was the control, in Australia, of the introduced weed, St. John's Wort (*Hypericum perforatum*), by means of insects, especially leaf-eating beetles.

Although it is impossible to write with enthusiasm of Tillyard's contribution to applied entomology, it is far otherwise as regards other aspects of entomology. He was in every way a great entomologist. In his publications, which comprised nearly 200 papers, he ranged over the whole insect kingdom and described new material in all but a very few Orders. While his interests lay especially with the more primitive groups of insects, he had an unrivalled knowledge of all groups. Apart from his work with the Odonata, his most significant contributions were his series of papers entitled the "Panorpid Complex" and his studies of fossil insects.

Following his early work with dragonflies, he turned his attention to the Neuroptera and the first of his studies of Australian Neuroptera was published by the Society in 1916, and the eighth, and final part, in 1919. In this series of papers he dealt, not only with the classification of the group, but also with their morphology and life-histories. In 1917 his first paper on the Mecoptera was published, an Order which was to hold his interest to the end of his career. The series of papers on the Panorpid Complex was published by the Society in 1918 and 1919. In these papers he opposed Handlirsch's views that the Holometabola had a quadruple origin, and as well as suggesting that the Neuroptera and Mecoptera had much in common, he suggested that the Mecoptera was the central Order from which all the rest of the Holometabola, apart from the Coleoptera and Hymenoptera, may well have been derived. In this series of papers, as well as in others, he set out to make a comparative study of the mouth-parts and other imaginal structures, and as well, the structure of the larvae and pupae. In actual achievement he

seldom progressed further than a study of the wings, but his investigations of the difficult problems associated with wing venation were of such a high calibre that they surpassed all else written by his contemporaries on this topic.

Tillyard's rapidly developing grasp of this aspect of the comparative morphology of insects was to serve him in good stead when he undertook the study of fossil insects, of which, in most instances, little more than the wings are preserved. His first paper on fossil insects was published in 1916 and his last in 1937.

The greater number of his fossil papers deals with the Triassic insects of Queensland, the Upper Permian insects of New South Wales and the Lower Permian insects of Kansas. In the light of more recent knowledge some of his interpretations and deductions, such as those concerning the ancestry of the Hymenoptera, have been shown by others to be incorrect. Nevertheless, regarded as a whole, his long series of papers dealing with these three separate faunas represents a brilliant and outstanding contribution to a difficult and fascinating field of study.

It was to be expected that Tillyard's interest in extinct groups of insects, and in primitive insects, would induce him to ponder the problem of the origin of insects, and in 1930, he chose as his subject for the Presidential Address to Section D of the meeting of the Australian and New Zealand Association for the Advancement of Science, at Brisbane, "The Evolution of the Class Insecta". In this lecture, which was published later the same year in an extended form in the *Proceedings of the Royal Society of Tasmania*, he put forward an ingenious but unnecessarily complex hypothesis. Having reached the conclusion that insects must have been derived from the Symphyla, he attempted to explain how progoneate Symphyla and opisthogoneate insects can have been derived from a common ancestor, and in both instances suggested that post-cephalic somites had been added by anamorphosis.

Another subject which interested him was the origin of the insect fauna of Australia and New Zealand, and no man was better fitted to write on this topic.

Tillyard was a keen angler, and to this may be ascribed his interest in the Ephemeroptera, Perlaria and Trichoptera, in all of which groups he produced, not just short papers containing brief descriptions, but revisions which were monographic in scope. While his book on the insects of Australia and New Zealand owed much to the co-operation of friends, it was entirely original in conception, and will long remain a monument to his vast knowledge and great energy. It has earned him the gratitude of all Australian entomologists as well as that of workers in this field in other countries.

A lesser known book was published in 1936 and dealt with the supposed Pre-Cambrian fossils from the Adelaide Series in South Australia. These fossils were claimed by Sir Edgeworth David and by Tillyard to be the remains of the oldest forms of life as yet discovered, and were said to represent a new Class of Arthropods, the Arthrocephala, of which Tillyard described two species.

Tillyard's early training had been as a mathematician; he taught mathematics for some years and he retained his interest and grasp of the subject long after he gave up teaching. It is thus surprising to note that he never made use of mathematics in any of his biological work.

Tillyard was a man of vivid personality and wide interests. All that he did was done with evident relish and enjoyment, and with great and infectious enthusiasm. He was of a mercurial disposition, and though most often he was engaged in following some interest with intense keenness, there were times, when due to severe pain, his spirits sank to their lowest ebb. He enjoyed people and personal contacts and was especially happy and stimulated when talking on some topic to an appreciative audience, whether to a few people gathered around him or to a packed lecture theatre. As well as being a brilliant conversationalist, he was an excellent lecturer, since he was a confident, fluent speaker with a good command of words. His presentation was somewhat dramatic and he did not hesitate to draw, while lecturing, on his vivid imagination.

Few men with so many calls on their time contrive to be such good correspondents. His letters were not just brief accounts of doings and happenings, but were full of interest, and were vivid expressions of his personality and intense vitality.

He had numerous hobbies of which perhaps gardening took pride of place, and he delighted in growing rare and unusual plants, especially those native to Australia and New Zealand. For him no garden was complete without a pond over which his beloved dragonflies could dart and hover. He took a great interest in all animals, and there were seldom periods when wallabies, 'possums and tame lizards and magpies were not to be found in his garden. He was at his best in the bush, when laden with collecting equipment, his keen eyes noting everything of interest, he would talk with equal knowledge on both insects and plants. Always encouraging to young biologists and to others with but little knowledge of his favourite subjects, he would take infinite pains to answer questions in clear and simple language.

In spite of his frail physique and poor health, he had great staying powers, and when his interests were involved, his mind would overcome all his physical disabilities and very often, when out on expeditions in the bush, he would outlast seemingly more vigorous men.

Although his health prevented him from taking part in active games, he played tennis up to 1928 and he took an interest in games, especially in cricket and tennis. Nothing gave him more pleasure than to see his daughters excel at sport, and many will remember the intense excitement he displayed while watching hockey matches in which his girls were playing. He took a great pride in his family and in all its doings.

As a host he excelled, and those who were privileged to attend seminars at his house, or to visit it for tea on Sunday afternoons, will remember the friendly and stimulating atmosphere of his home.

Tillyard had the spiritual side of his nature highly developed and he was a regular church-goer. He once wrote a hymn, for which he also composed the tune; he also wrote a novel, but this was never published. His interest in Psychical Research, which extended over many years, was pursued with the same fearless vigour that he gave to all his undertakings. Although advised by several friends to desist from following up his investigations in this direction, he remained undeterred, and in 1928 published in *Nature* an account of what he considered to be evidence of the survival of human personality following physical death.

He had a keen sense of civic responsibility, and both in Nelson and in Canberra, supported all causes having as their object the furtherance of the well-being of the community. He served on the Council of Canberra University College and was most anxious that Canberra should become a University centre. The *Australian National Review*, of which he only lived to see a few numbers issued, was one of his interests, and not only did he act as joint-editor of this Review, but he was also partly responsible for its inception.

All those who knew Tillyard, and he had a very wide circle of friends in all walks of life, will need no reminder of his personality. Although a decade has passed since his death, his memory remains a vivid picture, for his mental alertness, ready wit and puckish humour were unique. They will remember him, too, as a stimulating friend and companion, and if he was perhaps somewhat egocentric, this was but a single facet of a great character.

No account of Tillyard's life would be complete without some mention of the part played in his career by his wife. His debt to her was incalculable. During the period when he was at Sydney University studying for his B.Sc. degree, the Tillyards were in difficult financial circumstances, and it was entirely due to Mrs. Tillyard's devotion and encouragement and to her sheer hard work, that her husband was enabled to complete his studies and to bring them to such a successful conclusion. Not only did she nurse him through long and distressing illnesses, help him in his work with her criticism, and also by illustrating in colour his articles on insects in the *Australian Encyclopaedia* and in his other books, but she was a constant and unswerving support to him when he was overcome by periods of deep depression. She shared his many interests, not merely as a passive onlooker, but as an active participator, and it can be truly said that it was to his wife above all that he owed not only his happy home life, which meant so much to him, but also all his success.